

AD-A074 130

COLUMBIA UNIV DOBBS FERRY NY HUDSON LABS

SOME COMMENTS ON THE SENSITIVITY OF THEORETICAL AND EXPERIMENTAL--ETC(U)

FEB 63 M KLERER

NONR-266(84)

F/G 20/1

UNCLASSIFIED

TM-70

NL

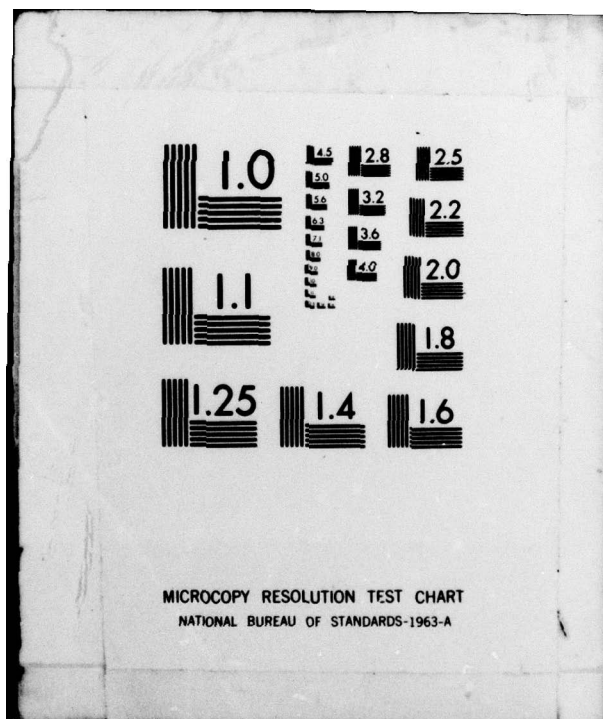
OF
AD
A074130



END
DATE
FILMED

10-79

DDC



ADA 074130

LEVEL 4

C
mc

G.1
COLUMBIA UNIVERSITY
HUDSON LABORATORIES
CONTRACT Nonr-266(84)

D.D.C.
RECEIVED
SEP 19 1979
C

RETURN TO LIBRARY

DDC FILE COPY

This document has been approved
for public release and sale; its
distribution is unlimited.

78 06 23 051

79 09 17 040

APR - 9 1963

... on the sensitivity of theoretical
and experimental results. Tech. Memorandum
No. 70. February 4, 1963. o. 1.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) SOME COMMENTS ON THE SENSITIVITY OF THEORETICAL AND EXPERIMENTAL RESULTS.		5. TYPE OF REPORT & PERIOD COVERED Technical Memorandum
7. AUTHOR(s) Klerer, Melvin /klerer		6. PERFORMING ORG. REPORT NUMBER No. 70
9. PERFORMING ORGANIZATION NAME AND ADDRESS Columbia University, Hudson Laboratories Dobbs Ferry, NY 10522		8. CONTRACT OR GRANT NUMBER(s) Nonr-266(84)
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Naval Research, Code 220 800 North Quincy Street Arlington, VA 22217		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 126P.1
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE 4 FEB 63
LEVEL II		13. NUMBER OF PAGES
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited. 14 TM-70		15. SECURITY CLASS. (of this report) UNCLAS
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

172 050

JOB

DD FORM 1473
1 JAN 73

EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-LF-014-6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

61

COLUMBIA UNIVERSITY
HUDSON LABORATORIES
CONTRACT Nonr-266(84)

Hudson Laboratories ✓
of
Columbia University
Dobbs Ferry, New York

Robert A. Frosch
Director

Technical Memorandum No. 70

**SOME COMMENTS ON THE SENSITIVITY OF
THEORETICAL AND EXPERIMENTAL RESULTS**

by

Melvin Klerer

February 4, 1963

UNCLASSIFIED

This work was supported by the Office of Naval Research
under Contract Nonr-266(84). Reproduction in whole or in
part is permitted for any purpose of the United States gov-
ernment.

78 06 23 051

69 09 16 040

APR - 9 1963

During his excellent presentation of February 1, 1963, C. S. Clay briefly touched upon ^{Discuss} the subject of the sensitivity to a change of parameters displayed by both the theoretical and experimental results for the acoustic propagation problems, usually considered by this laboratory. In the past, numerous other people here have commented on this phenomenon. As I have heard it, the consensus of opinion may be expressed by the declarations:

- 1) "Theory" and experimental results are sensitive to a change in parameters, e. g., source depth, receiver depth, frequency, etc.

and

- 2) "Theory" and experimental results are equally sensitive.

I have no quarrel with assertion 1). However, I have long had my doubts about the correctness of assertion 2).

Recently I resumed in an expanded and detailed manner some "Ray-Theory" (Geometrical Optics) type calculations, first done some years back. As a by-product of my present calculations, I have had the chance to verify, in a precise manner, my earlier thoughts on the possible inadequacy of assertion 2).

One of the things done so far is to compute the pressure, due to coherent interference of multipaths, for interesting ranges and depths. The results of one such set of calculations was compared to the results

produced by a normal mode program of Tolstoy and May.¹ We were interested in the sensitivity as a function of receiver depth. The identical model was used in both calculations, and there was no reason, on physical grounds, to suspect that the selected depths (1400 to 1500 ft) or the selected range (40 to 80 nautical miles) lay in a particularly unstable region of what was a very simple 3-layer model of the deep ocean. The frequency was chosen to be low (10 cps) so that the depth variation (100 ft) was of the order of $1/5$ of the basic cw wavelength.

One of the "indices of sensitivity" that we used was simply the distance between successive peaks of the envelope of pressure as a function of range $\equiv L$.

For this case we noted:

- a) The rate of change of L with depth for the RT ("Ray-Theory") calculation was of opposite sign to that of the NM (normal mode) calculation.

$$b) \quad \frac{\left| \frac{\Delta \bar{L}}{\Delta D} \right|_{RT}}{\left| \frac{\Delta \bar{L}}{\Delta D} \right|_{NM}} \cong -.385 ,$$

where the bar denotes an average over range and D is the depth.

¹Ivan Tolstoy and Jack May, "A numerical solution for the problem of long-range sound propagation in continuously stratified media with applications to the deep ocean," J. Acoust. Soc. Am. 32, 655-660 (1960).

c) The relative change of \bar{L} , i.e., $\left\{ \frac{\bar{L}_{1500} - \bar{L}_{1400}}{\frac{1}{2}(\bar{L}_{1500} + \bar{L}_{1400})} \right\}$.

was + 12.3 percent for RT but was -40.5 percent for NM, giving an overall difference of ~53 percent in relative change between the two calculations.

So far we have made this comparison for only one type of situation. If further study does not emasculate these figures, then we would come to the conclusion that

- I There is a sharp difference in the sensitivity predicted by these two "theories."
- II The difference is so sharp that a (conceptually) simple experiment can easily decide which "sensitivity" is closer to the real world.
- III Because of I), a fit of "theory" to experiment cannot be expected to agree in a detailed fashion, yet the contrast between the two calculations is great enough so that it is easy to make a statistically significant choice between the two numerical programs.
- IV That irrespective of theoretical arguments, the actual sensitivity of propagation to change in physical parameters has not been elucidated and what is wanting is reliable experimental results and meaningful analyses of same.

Acc. on For	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NTIS C&I			
DEG TAB			
Unannounced			
Justification			
By			
Distribution/			
Availability Codes			
Avail and/or			
Dist special			
Dist	A		